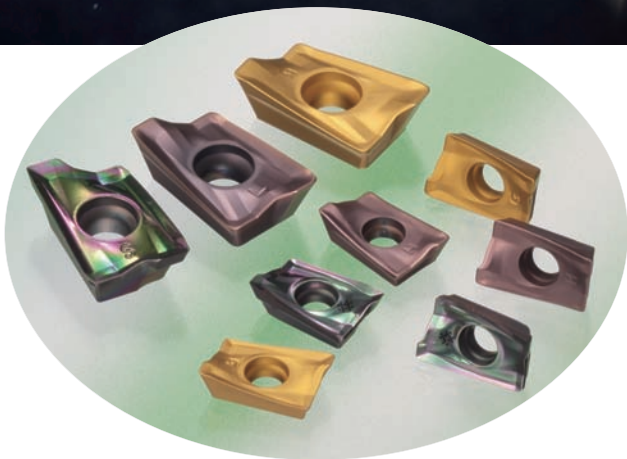
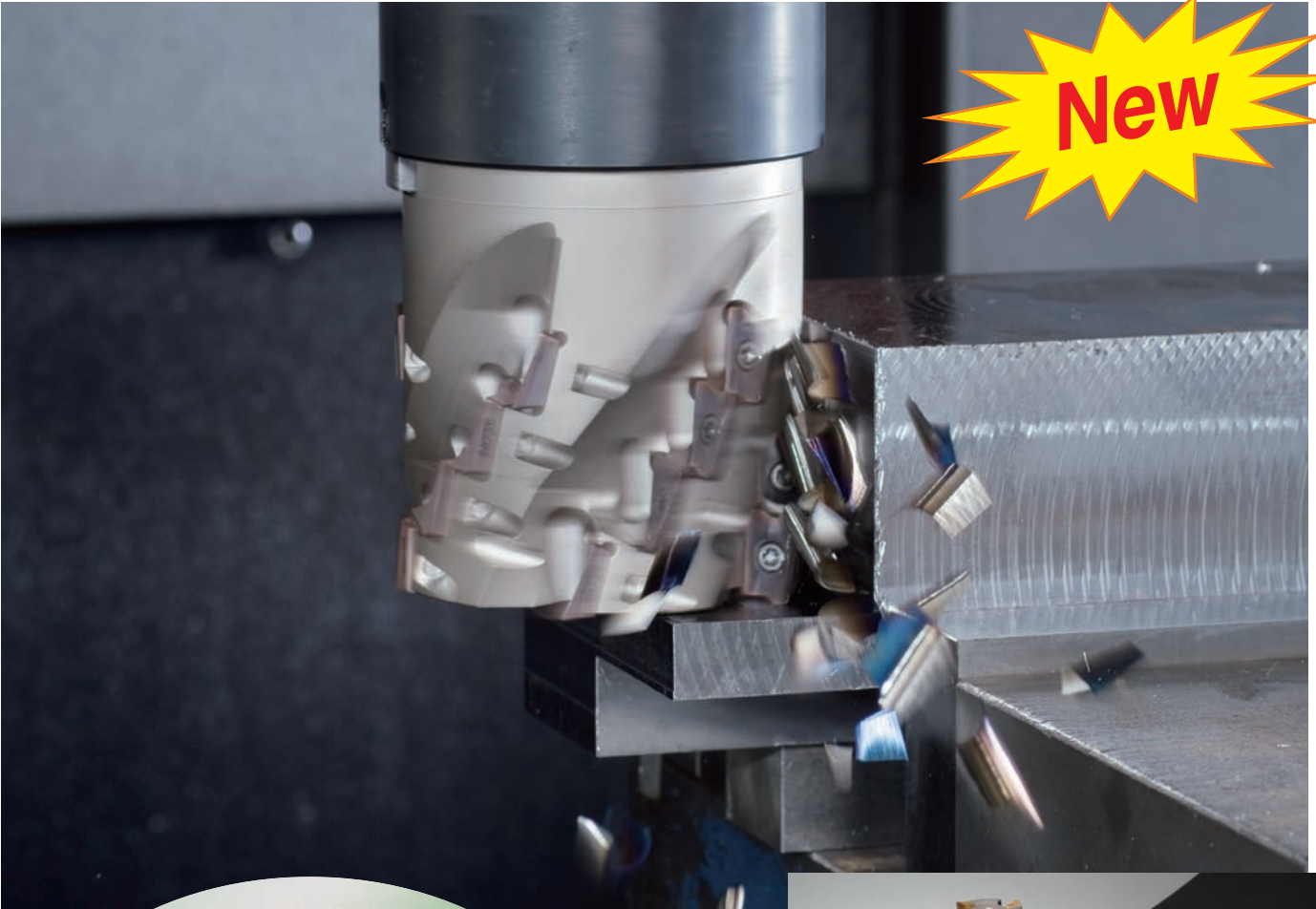


# Ultimate Performance Deep Shoulder Milling System

## Wave Repeater Mill **WRX** Type



**Soft Cutting Action**  
**High Feed Rates**  
**Impressive Tool Life**

 **SUMITOMO**

CARBIDE - CBN - DIAMOND

# Wave Repeater Mill WRX Type

## Ultimate Performance in Deep Shoulder Milling



### General Features

The WRX Wave repeater end mill system features AXMT style inserts vertically mounted and positioned to provide a long continuous cutting edge suitable for deep shoulder milling. Designed to run at elevated feed rates the soft cutting action reduces cutting resistance, vibration and noise to substantially improve tool life and surface finish.

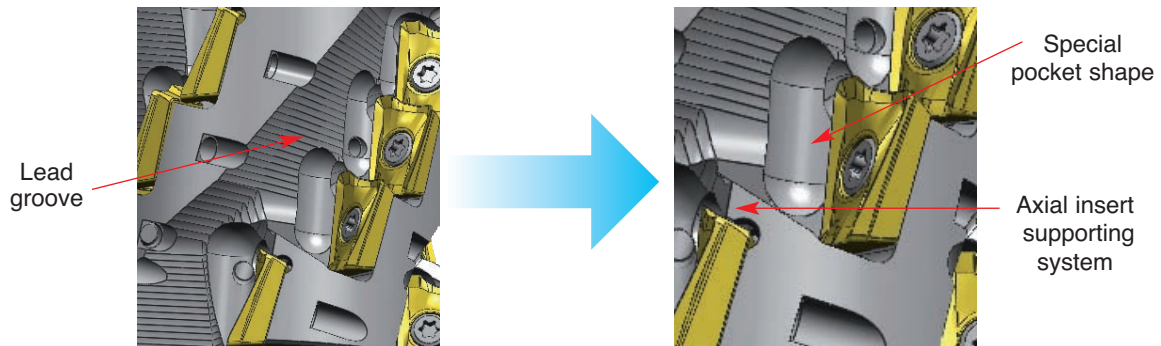
Available with our new generation Super FF and Super ZX coated inserts for unbeatable performance.

### Product Range

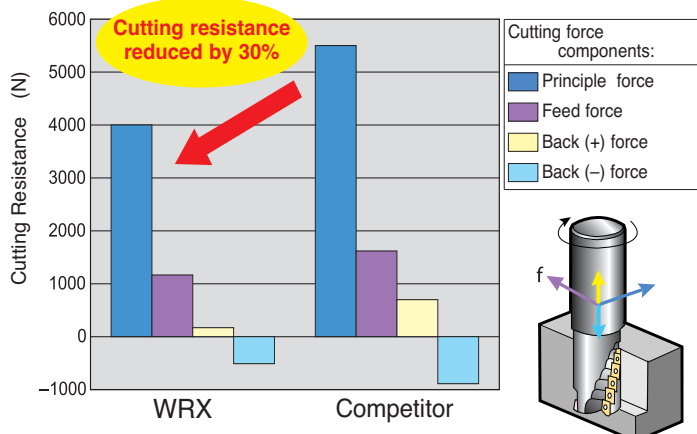
- WRX 2000 series with 12 mm inserts
- WRX 3000 series with 17mm inserts
- Cutter Diameters - 20mm ( $d_{oc} = 18mm$ ) to 100mm ( $d_{oc} = 53mm$ )
- Special Order Options – WRX Cutter with integrated arbor  
Shell type with detachable head
- Wide ISO Application Range – P/M/K/N classification

### Features

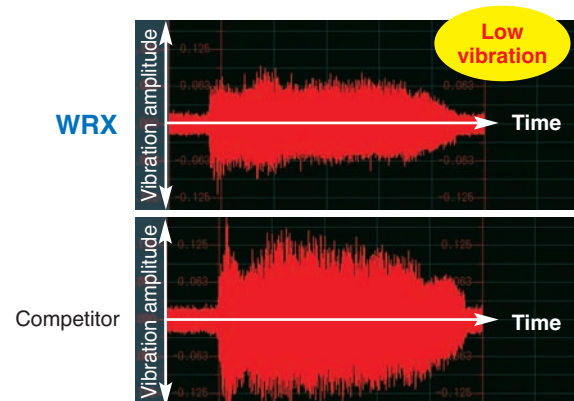
- Optimised insert positions reduce cutting resistance and vibration
- Integral coolant improves chip flow
- Primary chip slot for smooth and fast chip evacuation
- Optimised insert pocket maximises rigidity
- Bottom edge support improves tool life and cutting performance



### Cutting Resistance Comparison



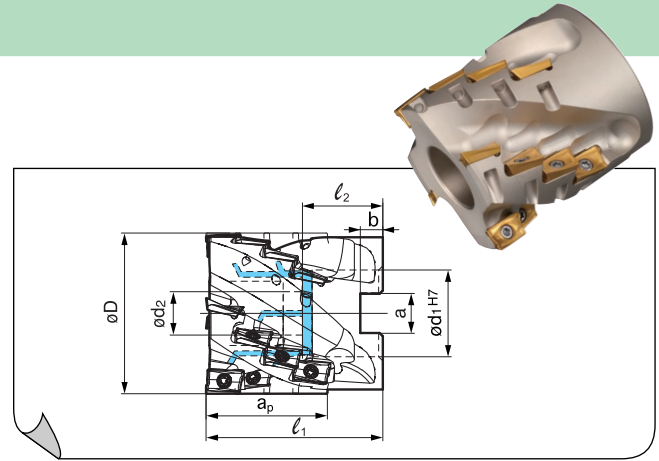
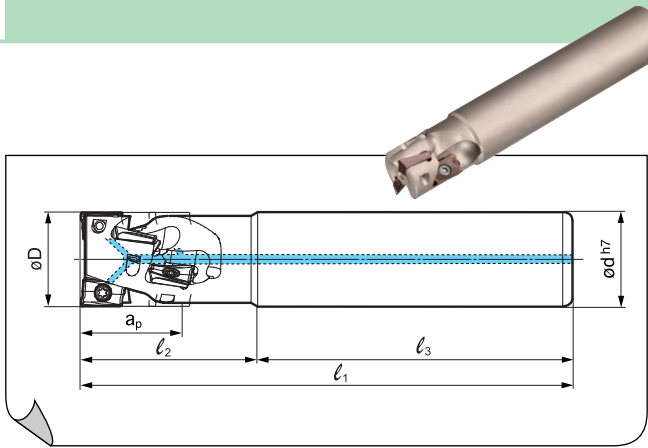
### Vibration Comparison



Work Material: C50  
Tool: WRX2025RH27E25  
Cutting conditions:  $v_c = 100m/min$ ,  $f_t = 0,15mm/tooth$   
 $d_{oc} = 25mm$ ,  $w_{oc} = 10mm$ , Dry

Work Material: C50  
Tool: WRX3080RH53F32  
Cutting conditions:  $v_c = 150m/min$ ,  $f_t = 0,15mm/tooth$   
 $d_{oc} = 25mm$ ,  $w_{oc} = 10mm$ , Dry

# WRX 2000 Series with AXMT 12 mm inserts



## Body (Cylindrical Shank Type)

Shank	Cat. No.	Stock	Depth of cut (ap)	Dimensions (mm)					No. of teeth	No. of rows	Effective teeth
				øD	ød	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>			
	WRX2020RH18E20	●	18	20	20	120	40	80	4	2	2
	WRX2020RH36E20	●	36	20	20	130	45	85	4	4	1
	WRX2025RH18E25	●	18	25	25	130	45	85	6	2	3
	WRX2025RH27E25	●	27	25	25	130	45	85	6	3	2
	WRX2032RH18E32	●	18	32	32	140	50	90	8	2	4
	WRX2032RH27E32	●	27	32	32	130	45	85	9	3	3
	WRX2040RH18E40	●	18	40	40	160	40	120	10	2	5
	WRX2040RH36E40	●	36	40	40	130	45	85	16	4	4

## Body (Shell Type)

Cat. No.	Stock	Depth of cut (ap)	Dimensions (mm)					No. of teeth	No. of rows	Effective teeth			
			øD	ød <sub>1</sub>	ød <sub>2</sub>	a	b						
WRX2040RH18F16		18	40	16	9	8,4	5,6	50	39	18	10	2	5
WRX2040RH36F16	●	36	40	16	9	8,4	5,6	55	44	18	16	4	4
WRX2050RH18F22		18	50	22	11	10,4	6,3	50	36	20	10	2	5
WRX2050RH36F22	●	36	50	22	11	10,4	6,3	55	41,5	20	16	4	4

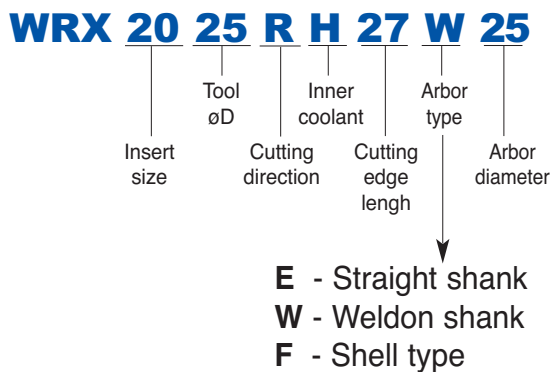
## Body (Weldon Shank Type)

Shank	Cat. No.	Stock	Depth of cut (ap)	Dimensions (mm)					No. of teeth	No. of rows	Effective teeth
				øD	ød	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>			
	WRX2020RH18W20	●	18	20	20	120	40	80	4	2	2
	WRX2020RH36W20	●	36	20	20	130	45	85	4	4	1
	WRX2025RH18W25	●	18	25	25	130	45	85	6	2	3
	WRX2025RH27W25	●	27	25	25	130	45	85	6	3	2
	WRX2032RH18W32	●	18	32	32	140	50	90	8	2	4
	WRX2032RH27W32	●	27	32	32	130	45	85	9	3	3
	WRX2040RH18W40	●	18	40	40	160	40	120	10	2	5
	WRX2040RH36W40	●	36	40	40	130	45	85	16	4	4

## Spare Parts

Wrench	Screw
TRDR 08 IP	BFTX 0306 IP

## Description Rule

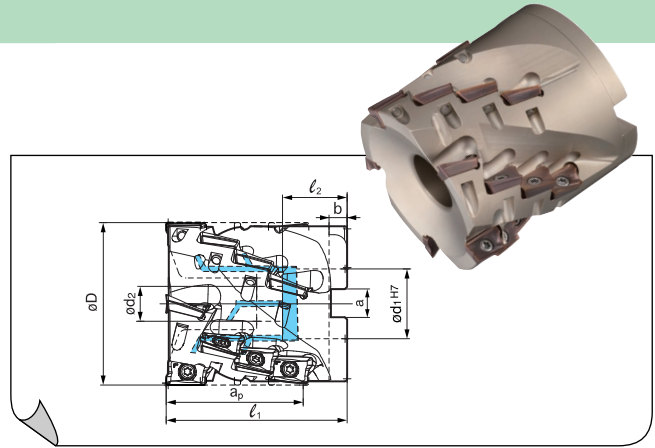
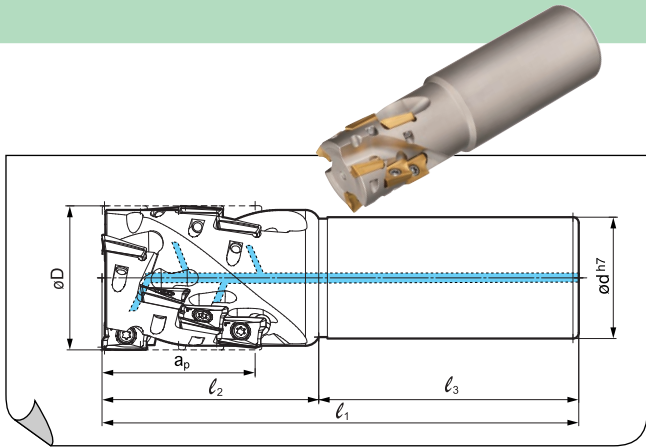


## Inserts (Same as for Wavemill WEX 2000 Type)

Cat. No.	Coated Carbide					DLC Coated DL1000	Un Coated H1	Dimensions (mm)	
	ACP 100	ACP 200	ACP 300	ACK 200	ACK 300			r	a
	AXMT 123504 PEER-G	●	●	●	●			●	
AXMT 123508 PEER-G	●	●	●	●	●			0,8	0,08
AXMT 123512 PEER-G	●	●	●	●	●			1,2	0,08
AXMT 123504 PEER-H	●	●	●	●	●			0,4	0,08
AXMT 123508 PEER-H	●	●	●	●	●			0,8	0,08
AXMT 123512 PEER-H	●	●	●	●	●			1,2	0,08
AXET 123502 PEFR-S						●	●	0,2	0,025
AXET 123504 PEFR-S						●	●	0,4	0,025
AXET 123508 PEFR-S						●	●	0,8	0,025

L: Low cutting Force, G: General Purpose, H: Strong type, S: For Aluminium Alloy

# WRX 3000 Series with AXMT 17 mm inserts



## Body (Cylindrical Shank Type)

Shank	Cat. No.	Stock	Depth of cut (ap)	Dimensions (mm)			No. of teeth	No. of rows	Effective teeth
				øD	ød	l <sub>1</sub> l <sub>2</sub> l <sub>3</sub>			
	WRX3032RH40E32		40	32	32	150 65 85	6	3	2
	WRX3040RH27E40		27	40	40	180 60 120	6	2	3
	WRX3040RH40E40	●	40	40	40	150 65 85	9	3	3
	WRX3050RH27E40		27	50	40	180 60 120	8	2	4
	WRX3050RH53E40	●	53	50	40	165 75 90	12	4	3



## Body (Shell Type)

Cat. No.	Stock	Depth of cut (ap)	Dimensions (mm)						No. of teeth	No. of rows	Effective teeth		
			øD	ød <sub>1</sub>	ød <sub>2</sub>	a	b	l <sub>1</sub> l <sub>2</sub> l <sub>3</sub>					
WRX3050RH27F27		27	50	22	11	10,4	6,3	50	36	20	8	2	4
WRX3050RH53F22	●	53	50	22	11	10,4	6,3	70	56	20	12	4	3
WRX3063RH27F27		27	63	27	13,5	12,4	7	70	34	23	10	2	5
WRX3063RH53F27	●	53	63	27	13,5	12,4	7	70	54	23	16	4	4
WRX3080RH27F32		27	80	32	17	14,4	8	50	30	25	12	2	6
WRX3080RH53F32	●	53	80	32	17	14,4	8	85	63	26	20	4	5
WRX3100RH27F40		27	100	40	21	16,4	9,5	85	40	30	14	2	7
WRX3100RH53F40	●	53	100	40	21	16,4	9,5	85	59	30	24	4	6

## Body (Weldon Shank Type)

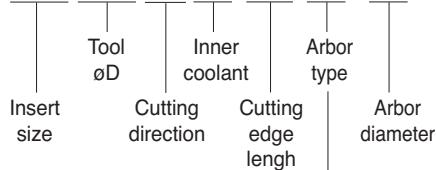
Shank	Cat. No.	Stock	Depth of cut (ap)	Dimensions (mm)			No. of teeth	No. of rows	Effective teeth
				øD	ød	l <sub>1</sub> l <sub>2</sub> l <sub>3</sub>			
	WRX3040RH27W40		27	40	40	180 60 120	6	2	3
	WRX3040RH40W40	●	40	40	40	150 65 85	9	3	3
	WRX3050RH27W40		27	50	40	180 60 120	8	2	4
	WRX3050RH53W40	●	53	50	40	165 75 90	12	4	3

## Spare Parts

Wrench	Screw
	
TRDR 15 IP	BFTX 0409 IP

## Description Rule

**WRX 30 40 R H 40 W 40**



E - Straight shank  
W - Weldon shank  
F - Shell type

## Inserts (Same as for Wavemill WEX 3000 Type)

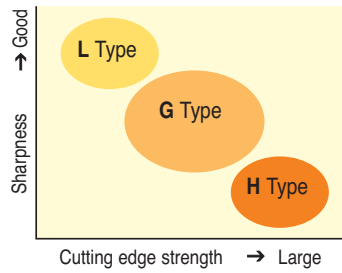
Cat. No.	Coated Carbide					DLC Coated DL1000	Un Coated H1	Dimensions (mm)	
	ACP 100	ACP 200	ACP 300	ACK 200	ACK 300			r	a
	AXMT 170508 PEER-L	●	●	●	●			●	
AXMT 170504 PEER-G	●	●	●	●	●			0,4	0,08
AXMT 170508 PEER-G	●	●	●	●	●			0,8	0,08
AXMT 170512 PEER-G	●	●	●	●	●			1,2	0,08
AXMT 170516 PEER-G	●	●	●	●	●			1,6	0,08
AXMT 170520 PEER-G*	●	●	●	●	●			2,0	0,08
AXMT 170530 PEER-G*	●	●	●	●	●			3,0	0,08
AXMT 170508 PEER-H	●	●	●	●	●			0,8	0,08
AXMT 170512 PEER-H		●	●					1,2	0,08
AXET 170502 PEFR-S						●	●	0,2	0,025
AXET 170504 PEFR-S						●	●	0,4	0,025
AXET 170508 PEFR-S						●	●	0,8	0,025

L: Low cutting Force, G: General Purpose, H: Strong type,

S: For Aluminium Alloy

\* Cutter body modification is required.

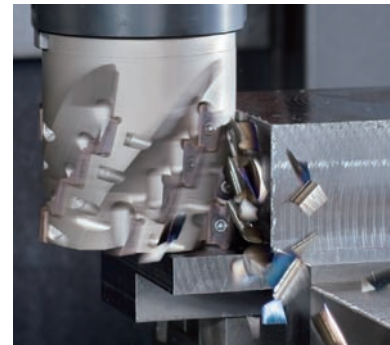
## Chipbreaker Selection



Work	Steel, Stainless Steel, Cast Iron		
Breaker	L Type	G Type	H Type
Features	Low cutting force	General Purpose	Strong Edge
Figure			
Application	Light cut, low rigidity milling and less burr	General - Interrupted milling	Roughing, heavy interrupted and high hard material milling

## Ramping (Slant Milling)

Tool diameter	Max. ramping angle	
	WRX 2000 Typ	WRX 3000 Typ
Ø 20	4°	
Ø 25	2°	
Ø 32	1°30'	
Ø 40	1°	2°
Ø 50	0°30'	1°
Ø 63		0°30'
Ø 80		0°30'
Ø100		Not possible



## Recommended Cutting Conditions

Tool: WRX 3050 RH53 F22, øD = 50mm, d<sub>oc</sub> = 50mm

ISO	Work material	Property, condition	Hardness (HB)	Grades (optimum grade in bold letters)	Chip breaker	Recommended cutting speed and feed / tooth according to width of cut ( w <sub>oc</sub> /øD ) - must be adjusted to actual machine and workpiece conditions.							
						10%		25%		>50%			
						v <sub>c</sub>	f <sub>t</sub>	v <sub>c</sub>	f <sub>t</sub>	v <sub>c</sub>	f <sub>t</sub>		
						min. Optimum max.	min. Optimum max.	min. Optimum max.	min. Optimum max.	min. Optimum max.	min. Optimum max.		
P	Steel, carbon steel	< 0,15% C, annealed	125	ACP 100	ACP 200	ACP 300	L - G	170 - 215 - 240	0,21 - 0,28 - 0,35	160 - 195 - 220	0,16 - 0,21 - 0,26	130 - 160 - 180	0,08 - 0,10 - 0,13
		< 0,45% C, annealed	190	ACP 100	ACP 200	ACP 300	L - G	160 - 195 - 220	0,21 - 0,28 - 0,35	140 - 175 - 190	0,16 - 0,21 - 0,26	110 - 140 - 160	0,08 - 0,10 - 0,13
		< 0,45% C, tempered	250	ACP 100	ACP 200	ACP 300	L - G - H	140 - 180 - 200	0,19 - 0,26 - 0,32	130 - 165 - 180	0,14 - 0,19 - 0,24	100 - 130 - 140	0,08 - 0,10 - 0,13
		< 0,75% C, annealed	270	ACP 100	ACP 200	ACP 300	L - G - H	140 - 170 - 190	0,19 - 0,26 - 0,32	120 - 155 - 170	0,14 - 0,19 - 0,24	100 - 130 - 140	0,07 - 0,10 - 0,12
		< 0,75% C, tempered	300	ACP 100	ACP 200	ACP 300	L - G - H	130 - 165 - 180	0,19 - 0,26 - 0,32	120 - 150 - 170	0,14 - 0,19 - 0,24	100 - 120 - 130	0,07 - 0,10 - 0,12
	Low alloyed steel	annealed	180	ACP 100	ACP 200	ACP 300	G - H	130 - 165 - 180	0,18 - 0,24 - 0,30	120 - 150 - 170	0,13 - 0,18 - 0,22	100 - 120 - 130	0,07 - 0,09 - 0,11
		tempered	275	ACP 100	ACP 200	ACP 300	G - H	130 - 160 - 180	0,17 - 0,23 - 0,28	120 - 145 - 160	0,12 - 0,16 - 0,20	100 - 120 - 130	0,07 - 0,09 - 0,11
		tempered	300	ACP 100	ACP 200	ACP 300	G - H	110 - 140 - 160	0,16 - 0,22 - 0,27	100 - 130 - 140	0,11 - 0,15 - 0,19	90 - 110 - 120	0,07 - 0,09 - 0,11
		tempered	350	ACP 100	ACP 200	ACP 300	G - H	100 - 130 - 140	0,16 - 0,21 - 0,26	100 - 120 - 130	0,11 - 0,15 - 0,19	80 - 100 - 110	0,06 - 0,08 - 0,10
	High alloyed and tool steel	annealed	200	ACP 100	ACP 200		G - H	70 - 85 - 90	0,15 - 0,21 - 0,26	60 - 80 - 90	0,11 - 0,14 - 0,18	60 - 70 - 80	0,06 - 0,08 - 0,10
tempered		325	ACP 100	ACP 200		G - H	30 - 35 - 40	0,14 - 0,19 - 0,24	30 - 35 - 40	0,10 - 0,14 - 0,17	20 - 30 - 30	0,06 - 0,08 - 0,10	
M	Stainless steel, ferritic/martensitic	annealed	200		ACP 200	ACP 300	L - G - H	120 - 150 - 170	0,15 - 0,20 - 0,25	110 - 135 - 150	0,11 - 0,14 - 0,18	90 - 110 - 120	0,07 - 0,09 - 0,11
	Stainless, martensitic	tempered	240		ACP 200	ACP 300	L - G - H	100 - 125 - 140	0,16 - 0,22 - 0,27	90 - 115 - 130	0,12 - 0,16 - 0,20	80 - 100 - 110	0,07 - 0,10 - 0,12
	Stainless, austenitic	plunged	180		ACP 200	ACP 300	L - G	80 - 95 - 110	0,15 - 0,20 - 0,25	70 - 85 - 90	0,11 - 0,14 - 0,18	60 - 70 - 80	0,06 - 0,08 - 0,10
K	Gray cast iron	GG	180	ACK 200	ACK 300		G - H	190 - 240 - 270	0,19 - 0,26 - 0,32	180 - 220 - 240	0,14 - 0,19 - 0,24	140 - 170 - 190	0,09 - 0,12 - 0,15
	Nodular cast iron	GGG	250	ACK 200	ACK 300		G - H	140 - 170 - 190	0,16 - 0,21 - 0,26	120 - 155 - 170	0,12 - 0,16 - 0,20	100 - 130 - 140	0,07 - 0,10 - 0,12
S	Exotic alloys (Resistant alloys, Ti + Ni alloys)	Fe based, annealed	200	ACK 200	ACK 300		L - G	40 - 45 - 50	0,12 - 0,16 - 0,21	30 - 40 - 45	0,08 - 0,11 - 0,14	30 - 35 - 40	0,07 - 0,09 - 0,11
		hardened	280	ACK 200	ACK 300		L - G	15 - 20 - 25	0,10 - 0,14 - 0,17	10 - 15 - 20	0,07 - 0,10 - 0,12	10 - 15 - 20	0,05 - 0,07 - 0,09
N	Aluminum alloy	Si < 13%			DL 1000	H1	S	510 - 635 - 710	0,23 - 0,31 - 0,38	460 - 580 - 640	0,17 - 0,22 - 0,28	390 - 485 - 540	0,08 - 0,12 - 0,14
		Si ≥ 13%			DL 1000	H1	S	150 - 190 - 210	0,19 - 0,25 - 0,32	140 - 175 - 190	0,14 - 0,18 - 0,23	130 - 165 - 180	0,08 - 0,10 - 0,13
	Copper alloy				DL 1000	H1	S	320 - 405 - 450	0,15 - 0,21 - 0,26	300 - 370 - 410	0,13 - 0,16 - 0,22	240 - 300 - 330	0,07 - 0,10 - 0,12

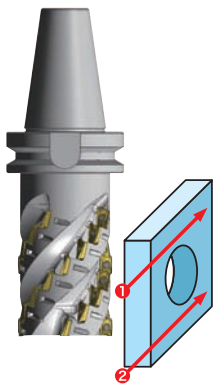
- Dry conditions recommended (air coolant) - when using lubricant we recommend CVD coated grades (ACP100 / ACK200) or tough PVD grades (ACP300 / ACK300).  
 - Insert geometries: L type for less cutting forces; thin walled components, G type for general use, H type offers higher cutting edge stability for rough or heavy cutting conditions.

# Wave Repeater Mill WRX Type

## High Efficiency Shoulder Milling of Deep Steps

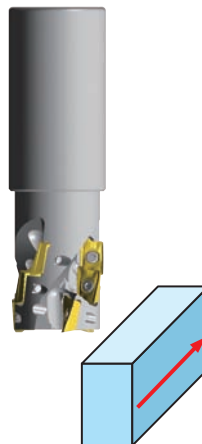
### Application Examples

Example 1



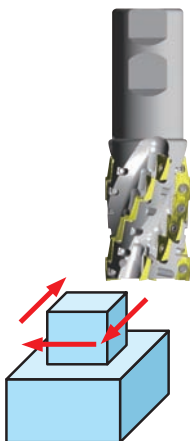
Work Material	Automotive Component / Cast Iron		
Tool	Body	Sumitomo WRX3000 Type Integrated Arbor	Competitor Ø 50
	Insert	AXMT	18 mm Size
	Insert grade	ACK300	PVD Type
	Tool dia. (mm)	50	50
	Total teeth	15	12
	Effective teeth	3	3
Cutting data	Cutting speed (m/min)	78	78
	Feed (mm/t)	0,13	0,13
	Axial depth of cut (mm)	45	45
	Radial width of cut (mm)	5	5
	Coolant	Dry	Dry
Result	Tool life / Cutting edge	500 min	300 min
Benefits	<b>1,7 times longer tool life</b>		

Example 2



Work Material	Construction Machine Parts (USt.42-2)		
Tool	Body	Sumitomo WRX2000 Weldon shank	Competitor Ø 38,1
	Insert	AXMT	18 mm Size
	Insert grade	ACP200	PVD Type
	Tool dia. (mm)	38,1	38,1
	Total teeth	24	16
	Effective teeth	4	4
Cutting data	Cutting speed (m/min)	180	137
	Feed (mm/t)	0,09	0,1
	Axial depth of cut (mm)	38,1	38,1
	Radial width of cut (mm)	3,2	3,2
	Coolant	Wet	Wet
Result	Out put / Cutting edge	60	40 min
Benefits	<b>1,5 times longer tool life 30% increased productivity</b>		

Example 3



Work Material	Machine Parts / Stainless Steel		
Tool	Body	Sumitomo WRX3040RH40E40	Competitor Ø 40
	Insert	AXMT	18 mm Size
	Insert grade	ACP 300	PVD Type
	Tool dia. (mm)	40	40
	Total teeth	9	6
	Effective teeth	3	2
Cutting data	Cutting speed (m/min)	125	125
	Feed (mm/t)	0,2	0,2
	Axial depth of cut (mm)	40	40
	Radial width of cut (mm)	5	5
	Coolant	Wet	Wet
Result	Out put / Cutting edge	20	5 ~ 10
Benefits	<b>Stable machining, double tool life with no breakage</b>		



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